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Vol. XXXI APRIL, 1955 No. 2

THE PAN-PACIFIC ENTOMOLOGIST

CONTENTS

LEE—The biology of the Mexican chicken bug, Haematosiphon inodorus (Duges) 47
LEECH—Emergence of the cicada Okanagana tristis Van Duzee 61
LINSLEY—Notes and descriptions of some species of Crossidius 63
GURNEY—Further notes on Iris oratoria in California 67
MATSUDA—The morphological and taxonomic significance of the basal abdominal segments in the Hemiptera-Heteroptera 73
LATTIN—The eggs of Corimelaena virilis (McAttee and Malloch) 75
CLAUSEN—Releases of recently imported insect parasites and predators in California, 1952-53 77
LEECH—Records of water beetles from Manchuria and Siberia 80
ANDERSON—Jurupa Entomology Club 82
JAMES—A new tachina fly of economic importance 83
WILLIAMS—A new species of wasp of the genus Solierella from southern California 85
SLEEPER—New rhyncophora from western United States 87
WASBAUER—Observations on the biology of Anoplius fulgidus Cresson .. 90
BOOK REVIEW 86
ZOOLOGICAL NOMENCLATURE 62

SAN FRANCISCO, CALIFORNIA • 1955

Published by the PACIFIC COAST ENTOMOLOGICAL SOCIETY
in cooperation with THE CALIFORNIA ACADEMY OF SCIENCES

THE PAN-PACIFIC ENTOMOLOGIST

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Published quarterly in January, April, July, and October with Society Proceedings appearing in the January number. Papers on the systematic and biological phases of entomology are favored, including articles up to ten printed pages on insect taxonomy, morphology, life history, and distribution.

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Publication date—June, 1955, Price $10.00.

Send orders to: Treasurer, Pacific Coast Entomological Society, California Academy of Sciences, Golden Gate Park 18, San Francisco.

Entered as second class matter, February 10, 1925, at the post office at San Francisco, under act of August 24, 1912.

The Pan-Pacific Entomologist

Vol. XXXI April, 1955 No. 2

THE BIOLOGY OF THE MEXICAN CHICKEN BUG, HAEMATOSIPHON INODORUS (DUGES)

(Hemiptera: Cimicidae)

ROBERT D. LEE

Department of Entomology
School of Tropical and Preventive Medicine
Loma Linda, California

Since its description in 1892 by Duges, little has been done with the Mexican poultry bug, *Haematosiphon inodorus*. Few locality records have been given for this species although Usinger (1947) mentioned that it is a common poultry pest found throughout the southwestern United States and Mexico. According to collection notes to be cited later and according to the observations of Townsend (1893) and others, colonies of *H. inodorus* may become quite numerous and troublesome. It is hoped that the following study will aid in the knowledge and control of this species.

The writer wishes to express his appreciation to Dr. Robert L. Usinger, University of California at Berkeley, under whose guidance this work was done. Special thanks are also due to Drs. Deane P. Furman and William C. Reeves, of the University of California, Berkeley, for their helpful advice and criticism of the project. To Raymond E. Ryckman, School of Tropical and Preventive Medicine, Loma Linda, California, goes my heartfelt thanks for his unfailing interest and help in making this study possible. For aid in collecting material, credit must be given to R. E. Ryckman, C. T. Ames, and K. Y. Arakawa. The author is indebted to Mrs. Frieda Abernathy for making the plate of *H. inodorus* and to Dr. I. Barry Tarshis for the photograph used in this paper. The School of Tropical and Preventive Medicine, Loma Linda, California, granted the author a one-year leave of absence for graduate study during which this work was done.

METHODS

Haematosiphon inodorus showed a reluctance to feed and oviposit from a few days to several weeks after being brought from the field to the laboratory. The colony as a whole was allowed to feed every three to five days and was maintained in an incubator

at about 25.5–29.0° C. and 58 to 64 per cent relative humidity. Before any quantitative records were taken, the colony was established until the insects seemed to be laying eggs in what was thought to be a normal manner.

The bugs were kept in straight walled jars approximately 5⅝ inches high and 1⅛ inches in diameter or in shell vials principally of two sizes: 2 inches high by ½ inch in diameter; 2¾ inches high by ¾ inches in diameter. The size of the container used was determined by the number and age of the insects in the container. The main colony was divided into a number of the 1⅛ inch diameter jars. The openings of all of the containing units were covered with rayon cloth consisting of 85 by 67 threads per inch. This mesh was found satisfactory to keep first instars in and still permit adults to feed through. The cloth was held in place by a tight fitting rubber band. Masking tape was then put around both the rubber band and the edge of the cloth to prevent any escape. This feeding technique was suggested by Ryckman's (1951) method of feeding Triatominae.

Bugs in the largest units were supported by heavy blotter paper in accordion-like folds extending the length of the jar. This supplied the insects with a means of reaching the host during feeding time and provided them with ample space on which to lay eggs. For immature insects being kept separate from the main colony and for most of those involved in special experiments, another type of unit was found to be more satisfactory. A disk of blotter paper was placed on the bottom of each of the smaller units, and no folded paper reached the top. If the disk is made of the correct diameter, it will fit snugly without slipping out. If a drop of melted paraffin is dropped on the bottom of the vial just before the disk is placed in it, the security of the disk may be made more sure. The reason for this type of unit will be made clear below.

The principal laboratory host used was the chicken, and unless otherwise indicated in the following experiments it will be assumed that the chicken was the host used. The bird was secured for the most part by merely tying its feet together. However, on occasion it has been necessary to quiet the chicken by putting a hood over its head or even tying its feet and wings to a board. The feeding units were held inverted on an unfeathered area on the side of the fowl by a ring stand and burette clamp. (See Figure I). Those bugs

having access to the chicken by the long folds of blotter paper could go and feed or remain away as they pleased. The insects in the smaller units containing disks of blotter paper were dropped to the cloth covering before application to the bird by inverting the vial and tapping it. This forced the insects to be close to the skin of the host, being separated from it only by the cloth through which they readily fed. This latter method proved highly successful and increased greatly the percentage of bugs feeding. It was especially adaptable to the youngest instars which had a tendency to remain away from the animal when the bugs were in jars containing folds of paper.

Fig. 1. Application of the colony rearing unit to the laboratory host for feeding of *Haematosiphon inodorus*.

It was found that the bugs tended to feed better if the feeding unit was covered with a cloth or paper before putting it in the burette clamp thereby allowing the bugs to feed in at least partial darkness. That darkness was not an absolute necessity is borne out not only by laboratory evidence but by the observation of Ryckman (personal communication) in which bugs were seen feeding on nestling owls in ample light.

SYSTEMATICS

In the original paper, Duges (1892) assigned *inodorus* to the genus *Cimex (=Acanthia)* and remarked that it warranted subgeneric recognition. In describing the adult, Duges erroneously

pointed out that it had no scent apparatus; he reasoned that the absence of a scent gland was compensated for by the nimble action and long rostrum of the bug.

Champion (1900) proposed the genus, *Haematosiphon*, for the reception of *inodora* and stated that *H. inodorus* has a scent apparatus, in contra-distinction to Duges' findings. On the basis of differences in the bristles, the proboscises, and the sterna, Jordan and Rothschild (1912) divided the family Cimicidae into three subfamilies, one of which was the newly recognized subfamily Haematosiphoninae. Jordan (1922) noted in *Haematosiphon* the dorso-medial position of the organ now verified as the organ of Berlese. He suggested that the medial position is probably the primitive one for this structure.

Although several workers have given descriptions of the adult, no one has described the egg or all of the pre-adult instars. Townsend (1893) described one of the later nymphal instars. A redescription of both sexes of the adult and a description of the egg and all the instars is here presented. The measurements given below indicate the mean sizes of twenty-five freshly killed specimens.

Diagnostic Description. Contrary to what Matheson (1950) and others have said, *Haematosiphon inodorus* is not a relatively large bug. Instead it is considerably smaller than *Cimex lectularius* Linneaus; it is somewhat similar in size to *Oeciacus vicarius* Horv. *H. inodorus* is characterized by its broad head, long rostrum, subcontiguous mesocoxa and metacoxa, laterally margined elytra, and dorsal organ of Berlese.

Detailed Description. Egg. (Plate 1, a.) Chorion white, unhatched egg colored light brown because of contents. Fine irregular pattern imprinted on chorion; unlike regular geometric figures on *Cimex lectularius* chorion. Length .883 mm.; width at widest part .441 mm.; diameter of ring about operculum .261 mm. Operculum moderately smooth.

First Instar Nymph. (Plate 1, b.) Elongate-oval, flattened, sparsely bristled. Overall body length 1.14 mm.; abdomen width .517 mm.

Head triangular, somewhat rounded, proportion of width to length 25::16.5, head width .382 mm. Eyes about one-sixth as wide as interocular space, 3::17. Antennae inserted slightly behind middle of anteocular space on ventro-lateral aspect of head; fourth segment pointed apically. Proportion of antennal segments, 6:11:11:16.5. Rostral proportions, 15.5:12.5:13; rostrum extending to posterior of middle coxae; overall length .619 mm.

Pronotum subrectangular, anterior concave, posterior convex, humeri rounded, width .441 mm., ratio of length to width 12.5::30, bearing a single, long bristle on each posterior corner. Mesonotum and metanotum less

rectangular in shape, shorter than pronotum, also bearing single long bristle on each posterior corner.

No indication of wing pads. First abdominal segment bearing single long bristle on posterior corner similar to those on thoracic segments.

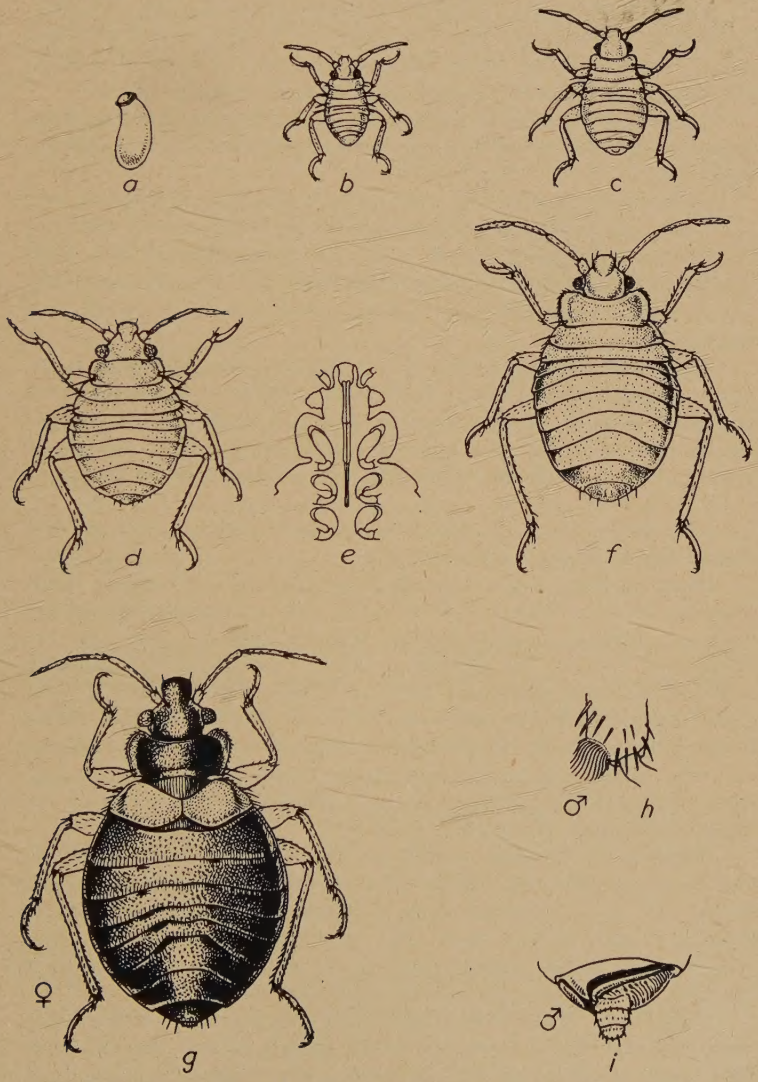

Plate I. Illustration of *Haematosiphon inodorus:* a) egg; b) first instar; c) second instar; d) third instar; e) ventral aspect showing rostrum; f) fourth instar; g) adult female; h) lateral view of disk on apical end of male mesotibia and metatibia; i) male terminalia.

Scattered bristles on venter, very few on dorsum, six long bristles extending beyond tip of abdomen; spicules present on legs. Tarsi two segmented; claws simple, curved. Small pads situated at base of claws.

Color uniformly pale amber except for bright ruby-red eyes.

Second Instar Nymph. (Plate 1, c.) Differing from preceding in following respects: more robust than first instar nymph. Head width .450 mm., width to length proportion, 31::21. Proportion of antennal segments, 7:16:15: 19.5. Proportion of rostral segments, 19:17:18, overall length .727 mm.

Apparent first abdominal segment not bearing long bristle on posterior corner. Overall body length 1.45 mm.; abdomen width .770 mm.; prothorax width .564 mm.

Third Instar Nymph. (Plate 1, d.) Differing from preceding in following respects: proportionately larger than previous instars. Head width .582 mm.; width to length proportion, 11::8. Proportion of antennal segments, 10:25 .5:21.5:23.5. Proportion of rostral segments, 26.5:21.5:24, overall length .983 mm. Prothorax width .775 mm; abdomen width 1.11 mm.; overall body length 2.14 mm.

Fourth Instar Nymph. (Plate 1, f.) Differing from preceding in following respects: proportionately larger than previous instars. Head width .741 mm.; width to length proportion, 24.5::17.5. Proportion of antennal segments, 13:34.5:24.5:25. Proportion of rostral segments, 15:13:14.5, overall length 1.28 mm. Prothorax width 1.01 mm.; abdomen width 1.51 mm.; overall body length 2.94 mm.

Adult Male. (Plate 1, i.) Elongate-oval, rather robust, surface polished, partly covered with short appressed hairs.

Head, including eyes, broader than long, 26.5::19, .825 mm. in width, somewhat pentagon shaped, tapering before eyes to front, broadly set into prothorax. Clypeus rounded, tapering abruptly behind widest part and attached in V-shaped invagination of head. Eyes one-fourth interocular space, 4.5::18, quite prominent. Antennae inserted behind middle of anteocular region, first segment somewhat globulose, third thinner than others, fourth pointed apically. Proportion of segments, 5:18:12.5:12.5. Rostrum extending to hind margin of mesosternum, approximately 1.44 mm. long, rather slender, bearing scattered sub-erect, short hairs particularly on last segment. Proportion of segments, 18:14:15.

Pronotum parallelogram shaped, a little more than twice as wide as long, wider in front than behind, sides convex, anterior angles produced beyond hind margin of head. Sides produced to plate-like border fringed with row of short, curved, simple hairs; posterior angles bearing two long, slightly curved bristles. Sparsely covered with short, appressed hairs, finely punctate. Width of pronotum at widest point, 1.11 mm.

Front margin of hemelytra together form rounded, V-shaped line across thorax, rounded behind. Hemelytra sloping laterally to form rounded, plate-like process extended beyond pronotum, wider behind than in front. Granular, with scattered, short hairs; row of long, slightly curved bristles on lateral edge.

Coxae stout, mesocoxae and metacoxae subcontiguous, mesocoxae closer together than metacoxae. Sparsely covered with short hairs. Ridge formed

between meso- and metacoxae extending to fourth abdominal sternite. Femora rather stout, clothed with short hairs. An oval disk bearing numerous short hairs located on apical end of pro- and mesotibiae (Plate 1, h.); disk appears from side to be a brush. Protarsi clothed with scattered hairs and bristles; meso- and metatarsi also bearing spines, particularly at apical end. Legs moderately long, tarsal claws simple and curved. Small, elongate pad having V-shaped striations located between tarsal claws.

Abdomen of recently molted, unfed specimen 2.00 mm. wide. Overall body length 3.34 mm. First abdominal segment longer than others. Posterior margin of first tergite straight across body, those following slightly rounded forward. Terminalia asymmetrical; penis directed to left side. Copulatory organ slightly curved, fitted into groove that runs up to hind margin of seventh sternite. Nearly all of first segment and posterior portion of other principal abdominal segments rather coarsely punctate, with short, fine, inconspicuous hairs. Tip of abdomen clothed with 30 to 50 long stiff hairs.

Long hairs of body dentate at tips.

Color description is of living specimen. Body walnut brown, hemelytra white with brown lateral edges, legs and antennae amber, eyes red.

Adult Female. (Plate 1, g.) Differing from male in following respects: abdomen more oval; general size somewhat larger. Head width to length proportion slightly greater, 28.2::22. Head width .874 mm. Rostrum length 1.54 mm. Width of prothorax at widest point 1.18 mm.

Pro- and mesotibia lacking apical disks.

Abdomen width 2.27 mm.; body length 3.9 mm. Fifth tergite strongly sinuated medially. Entrance to organ of Berlese located dorso-medially at fifth segment. Tip of abdomen symmetrical. Abdominal sternites 1 to 5 medially sinuated.

In uncleared freshly killed or living specimens older than the first instar nymph, bodies containing a green pigment may be seen scattered about the internal organs. This pigment may be that spoken of by Wigglesworth (1943) which results from a series of changes in the hemoglobin of ingested blood.

Comparison of Head Widths. Taylor (1931), Forbes (1934), Harries and Henderson (1938), and a number of others have used and discussed Dyar's rule in the study of changes in the head widths of successive instars of various insects. Dyar (1890) and others have shown that each instar of a given insect generally shows a fairly definite percentage increase in head width. This has been used with some degree of success to show the probable number of instars a species should have. That is, if there is a large gap in the head width range from one apparent instar to the next, it may be suspected that an instar has been overlooked. The application of Dyar's principle to *H. inodorus* is briefly considered here.

Head width measurements were made of twenty-five individuals

of each preadult instar and both sexes of adults. The ranges for these measurements are indicated in Table I and Figure 2. The means, the standard deviations of the means, and the growth quotients of the various age groups are also presented in Table I. The specimens used for these measurements were selected from groups being reared through from egg to adult. The groups were examined approximately every forty-eight hours; those individuals which molted were separated from the rest and were either used then for measurements of that particular instar or allowed to go on to later instars and adults.

TABLE I. Measurements of head widths and study of the progressive development in size from instar to instar in *H. inodorus*.

Age Group	Number Measured	Range in Size	Mean	Standard Deviation	Growth Quotient
Instar I	25	.356-.403 mm.	.382 mm.	±.0117	.....
Instar II	25	.425-.477 mm.	.450 mm.	±.0156	1.18
Instar III	25	.548-.616 mm.	.583 mm.	±.0183	1.30
Instar IV	25	.682-.806 mm.	.741 mm.	±.0311	1.27
Adult Male	25	.775-.884 mm.	.825 mm.	±.0298	1.11
Adult Female	25	.791-.930 mm.	.874 mm.	±.0326	1.18
					Average 1.21

When the logarithms of the means are plotted on coordinate paper, as in Figure 3, they fall approximately in a straight line and are fairly evenly spaced. The evidence indicates that *Haematosiphon inodorus* has but four preadult instars. This fact is also shown in the study made of the life history of this species. All other Cimicids and nearly all Hemiptera which have previously been studied have five preadult instars.

Life History Studies

Seventy-six eggs were placed individually in as many vials so that each specimen might be studied separately from its fellows; this permitted a much more accurate tabulation of the results than would have been possible otherwise. The vials contained disks of blotter paper on the bottom and were covered with cloth as described previously.

The eggs used were known to have been 48 hours old or less and were checked for hatching every second day after they were placed in the vials. On the second day after having hatched from the egg or molting from the previous instar, the bugs were allowed to feed. By thus waiting 48 hours after the period during which the insect

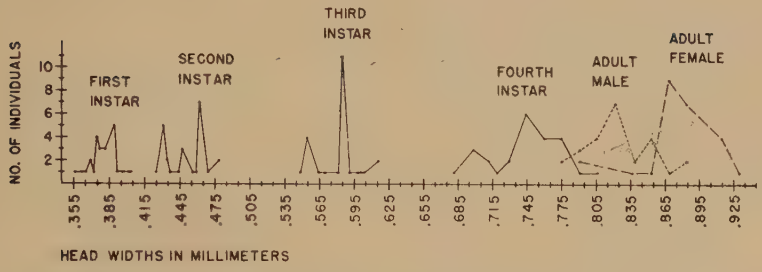

Fig. 2. Ranges of head widths of various instars of *Haematosiphon inodorus* shown graphically.

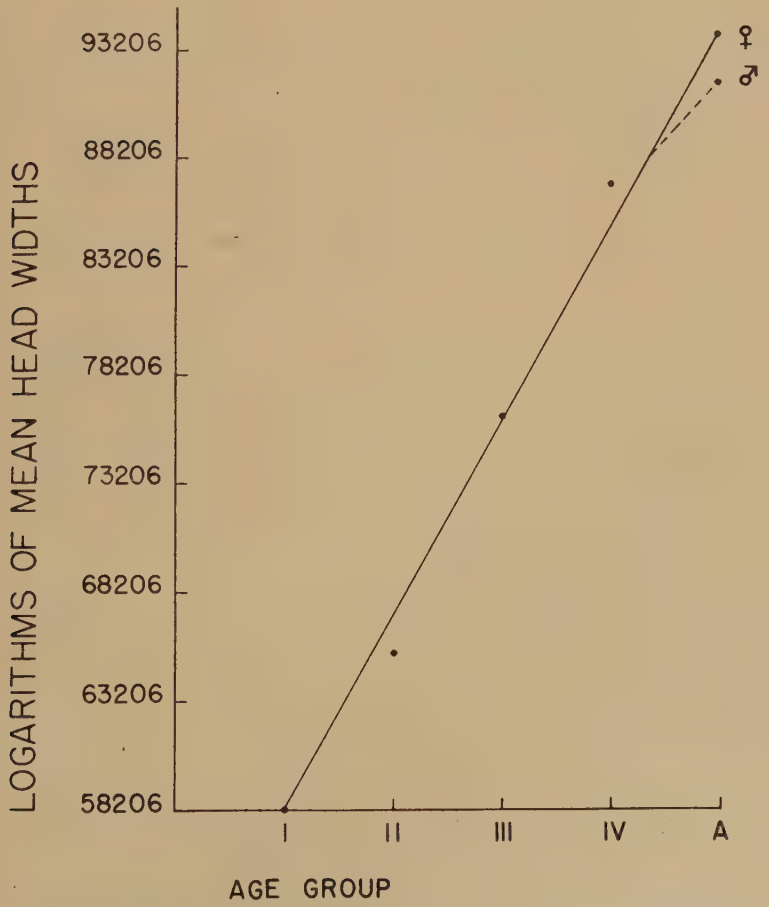

Fig. 3. Plotting of the logarithms of the mean head widths of the various instars of *Haematosiphon inodorus*.

hatched or molted, it was generally found that the bug would feed. There were exceptions as some individuals refused to feed for longer periods of time. Although this increased the length of time of the instar in which the individual hesitated to feed, it did not seem to affect the length of time of subsequent instars. Once having fed well in the "long" instar period, the bug generally progressed normally. Long instar periods were most frequent in the first instar.

Out of seventy-six eggs started in the life history study, seventy-two eggs or 94.7 per cent hatched. The average time required to hatch was 5.1 days. The average number of days required to develop from egg to adult was 36.5 days. The maximum was forty-six days, and the minimum was thirty. A summary of the remaining data of the life history study is presented in Table II.

TABLE II. Summary of life history data.

Instar	No. of Individuals	Percentage Molted	No. Days Required to Molt			No. died in each Instar
			Max.	Min.	Ave.	
I	72	73.6%	16	6	8.5	19
II	53	86.8%	12	6	7.8	5
III	48	93.7%	12	6	7.4	3
IV	45	91.1%	14	6	8.3	4
Adults	41	.....	....	..	....	....

Out of 474 newly molted adult *H. inodorus*, 203 were females, and 271 were males. This gives a percentage ratio of males to females of 57.2::42.8. Although a still larger sample might change the figures somewhat, the indications are that there is a slightly greater percentage of males than females in newly molted, laboratory reared adults. Why there are more males than females is, as yet, a matter of speculation.

Reuter (1913) suggested that bats were the original host to *H. inodorus* and tried to substantiate this theory by stating that chickens (the only host other than man known for this species) were not native to the Western Hemisphere while the bugs were. Usinger (1947) recorded for the first time collections of *H. inodorus* from native hosts; they were the California condor, the great horned owl, and two unidentified owls.

Specimens used in this study were taken from the nests of barn owls, *Tyto alba pratincola* (Bonaparte). The nests were located ten to twelve feet from the top of a thirty-five foot bank along the Santa Ana River, thirteen miles southwest of Riverside, three-fourths of a mile northeast of Norco in Riverside County,

California, at an elevation of about six hundred feet. The insects were found concentrated in cracks and crevices of the soft soil about the entrance and in the walls of the cave-like nests. From a single nest 1,425 bugs were taken; from another nest 1,778 specimens were collected. The bugs were by no means confined to the actual nest or its immediate entrance but were taken in numbers four to five feet and more away.

One of the first things the worker observes in handling *H. inodorus* is the swiftness with which the bugs, of all ages, move about.

H. inodorus is unable to climb a vertical, clean, glass wall. If, however, the angle is decreased from 90 degrees, a point is reached at which the insects are able to climb. The maximum angle which the bugs are able to climb depends on their age group. With the exception of the male adults, the younger the age group in which a given individual is, the better able it is to climb the wall. Maximum ranges for the various instars and for both sexes of adults were found to be: I, 45–49°; II, 40–44°; III, 32–36°; IV, 22–26°; adult female, 17–21°; adult male, 62–66°.

That the insects can climb at all on a clean glass wall is dependent at least in part on the presence of a small pad at the apical end of the last tarsal segment. The remarkable ability of the adult males to climb the glass wall is due to the presence of an additional "climbing organ" located on the apical end of the tibia of the first and second pairs of legs. This organ appears to be an oval disk bearing many hairs; from the side it looks like a small brush (Plate 1, h.). The climbing organ was observed in action by placing a living adult male upside down on a microscope slide and covering him with a cover glass. The organ appeared to be quite similar to that described by Gillett and Wigglesworth (1932) for *Rhodnius prolixus*, "an elastic sac distended with fluid." The fact that only the males have these tibial climbing organs might indicate that these are secondary sexual structures used during copulation.

Copulation takes place most frequently after feeding. The males run about in search of a female, and the act itself takes place in the following manner: the male climbs on the dorsal surface of the female, being lined up with her on a parallel axis. He inserts the copulatory organ into the sinuated fifth abdominal tergite which leads into the organ of Ribaga and the organ of Berlese.

The pair shakes vigorously from side to side much of the time while *in copulo;* the female may even run about with the male still in position. If there is a dearth of females in the colony, the males may be seen to mount other males and go through shaking motions similar to those that a copulating pair makes; this, however, lasts for a much shorter period than when the act takes place with a female. Both sexes need not have fed recently to become sexually excited when the colony as a whole is feeding. A well fed female seems to attract more males than an unfed one. If motion plays more of a role in attracting the male to the female than odor does, as Rivnay (1933) suggests for *Cimex lectularius*, then perhaps the larger size of the well fed female would explain its being more attractive than the unfed female. It would seem reasonable in this case to suspect that the warmth of the ingested blood is the attracting agent. However, males are attracted to fed females and not particularly attracted to fed males when enough females are present. Thus it would seem that neither motion nor the warmth of ingested blood serve primarily as the activators of the copulatory act. Whether or not a chemical stimulus or some other factor is the agent has yet to be solved.

Longevity without Food. The problem of how long the newly molted insect can live without food is an important one. This is particularly true when the host may be gone for several days before returning to the nest. An indication of the length of time that various stages may survive after molting is indicated in Table III.

TABLE III. Longevity of recently molted bugs without food.

Instar	Number Used	Number of days till death		
		Max.	Min.	Ave.
I	34	7	3	5.1
II	24	7	4	6.1
III	32	13	5	8.3
Adult female	21	25	11	14.9
Adult male	19	17	8	12.4

Although *Haematosiphon* is not usually considered to feed on mammals, it is important to know what animals other than birds it will feed on, particularly for some laboratory experiments. Various instars of bugs were allowed to feed on the closely clipped abdomen of a laboratory rabbit. Little hesitation was evidenced

by the insects to feed on the animal. Those which had fed to repletion molted to the next instar or to adults in a normal amount of time.

Poor results were obtained in an effort to feed second, third, and fourth instar nymphs on a young white rat. Eight out of thirteen bugs which had fed well on the rat were dead within four days after having fed. Although Mazzotti (1941) was successful in feeding *H. inodorus* on a mouse, the present writer did not meet with such success. Out of thirty-six hungry bugs of various instars which were placed for 24 hours in a small jar containing a suckling mouse, only eight fed at all, none to repletion. The insects were seen to crawl about on the mouse, but few were seen attempting to feed.

First, second, and third instar nymphs were allowed to feed on the abdomen of a bat *(Myotis* sp.) which had been stretched out and strapped down. Small numbers (3 to 5) of each instar fed; within 18 hours those bugs which fed were dead. Even though the insects were dead the blood was still the same bright red hue it was immediately after the bugs had fed. Still less successful results were obtained in an effort to feed the bugs on the Mexican free-tailed bat, *Tadarida mexicana* (Saussure).

Attempts to induce various instars of *H. inodorus* to feed on an unidentified cave toad and fence lizard met with failure.

Haematosiphon shows no reluctance to feed on human subjects at all. Duges' paper (1892) mentioned the fact that chicken growers complained of bites from this species. Townsend (1893) stated that this pest may "spread from roosts to dwelling-houses, where it proves more formidable than the bedbug". More recently (1952) Dr. J. N. Roney, Extension Entomologist of the University of Arizona, reported *(in litt.)* that in July, 1946, in Navajo County, Arizona, he "found the insects infesting two chicken yards and three homes to such an extent that the residents were forced to move out" so that a complete fumigation might be effected.

Summary

Techniques used in rearing *Haematosiphon inodorus* for the first time in the laboratory are noted.

A detailed description is here presented for the first time for the egg and all the preadult instars. A redescription of both sexes

of the adult is presented in greater detail than has been done by previous workers.

By rearing this species from egg to adult in individual vials and by studying its life history in detail, the fact that *H. inodorus* has only four preadult instars was demonstrated. A comparison of the degree of change in head width from one stage to the next, based on Dyar's principle, shows biostatistically that no instar was overlooked in the life history study. This is the first Cimicid and one of very few Hemiptera which has been shown conclusively to have only four preadult instars. A brief study of the sex ratio shows that there are more males than females in a laboratory reared population.

Collection notes indicate a new host for this species and point out that populations may build up to large numbers in the nest of the host. Various behavior patterns of this bug are presented which give a clearer understanding of its life history.

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EMERGENCE OF THE CICADA OKANAGANA TRISTIS VAN DUZEE

(Homoptera: Cicadidae)

Okanagana tristis Van Duzee is a common California species, but the only record for Mendocino County given by Simons (1954. The Cicadidae of California. Bull. Calif. Insect Survey, 2(3):177) is "Mendocino Co.: Unknown locality, 1♀, VII-20-23 (E. R. Leach, C.A.S.)."

Virtually all insects labeled "Mendocino Co." by Mr. Leach were taken on or close to his property at the junction of Yale Creek with Rancheria Creek, about two miles south of the *old* site of the Yorkville Post Office on Highway 128. On July 24, 1954 I was camped in a small neglected orchard on this property, and at about 8:30 P.M. (Pacific Daylight Saving time) noticed cicada nymphs crawling up grass and weed stems. By 10:30 P.M. most of them had completely emerged from the nymphal skins, but were still of a creamy white color. I am indebted to Dr. J. N. Simons for identifying one of the resultant adults—Hugh B. Leech, *California Academy of Sciences, San Francisco.*

ZOOLOGICAL NOMENCLATURE: NOTICE OF PROPOSED USE OF THE PLENARY POWERS IN CERTAIN CASES FOR THE AVOIDANCE OF CONFUSION AND THE VALIDATION OF CURRENT NOMENCLATORIAL PRACTICE (A. [N.S.]19)

Notice is hereby given that the possible use by the International Commission on Zoological Nomenclature of its Plenary Powers is involved in applications relating to the under-mentioned names included in Part 9 of Volume 9 of the *Bulletin of Zoological Nomenclature*, which was published on October 22, 1954:

(1) *Discoides; Cerebratulus; Polycitor; Scolixedion;* all being generic names in Renier (1804) *Prospetto* (now rejected for nomenclatorial purposes), question of validation of (p.263) (File Z.N.[S.]832).

(2) *Aglaja; Alcyonaria; Cystia; Rodens; Tuba; Tubulanus;* all being generic names in Renier (1807) *Tavola* (now proposed to be rejected for nomenclatorial purposes), question of validation of (p.264) (File Z.N.[S.]688).

(3) Names (generic and specific) given to aptychi of Ammonites, proposed suppression of (pp.266–269) (File Z.N.[S.]858).

(4) *Notropis* Rafinesque, 1818 (Class Osteichthyes, Order Cyprinida) proposed determination of gender as masculine (pp. 272–277) (File Z.N.[S.]663).

(5) *Cheloniceras* Hyatt, 1903 (Class Cephalopoda, Order Ammonoidea), proposed designation of type species for, in harmony with accustomed nomenclatorial usage (pp.278–280) (File Z.N.[S.]703).

(6) *Argus* Bohadsch, 1761 (Class Gastropoda), proposed retention of status for the purposes of the Law of Homonymy to preserve *Polyommatus* Latreille, 1804, from falling as a synonym of *Argus* Boisduval, 1832, (pp.281–283) (File Z.N.[S.]714).

(7) *minimus* Miller (J.S.), 1826, as published in the combination *Belemnites minimus* (Class Cephalopoda, Order Dibranchia), proposed validation of (pp.284–285) (File Z.N.[S.]823).

In addition, the above Part contains a proposal for the issue of a *Declaration* banning names based upon the aptychi of ammonites (File Z.N.[S.]589).

Any specialist who may desire to comment on any of the foregoing applications is invited to do so in writing to the Secretary to the International Commission (Address: 28 Park Village East, Regent's Park, London, N.W.1., England) as soon as possible. Every such comment should be clearly marked with the Commission's File Number as given in the present Notice.

NOTES AND DESCRIPTIONS OF SOME SPECIES OF CROSSIDIUS

(Coleoptera, Cerambycidae)

E. GORTON LINSLEY
University of California, Berkeley

The following notes and descriptions are offered at this time in order to permit the return of material borrowed in connection with a more comprehensive study. The writer regards *Oxoplus* synonymous with *Crossidius*, since those characters previously used to separate them clearly intergrade and no other constant differences are evident. The following species should be transferred to *Crossidius:*

Crossidius coccineus (Casey) new combination
Crossidius corallinus (LeConte) new combination
Crossidius cruentus (LeConte) new combination
Crossidius jocosus (Horn) new combination
Crossidius marginatus (LeConte) new combination
Crossidius ornaticollis (Lacordaire) new combination
Crossidius poecilus (Bates) new combination

Crossidius mojavensis Linsley, new species

Male: Length 17.5 mm., breadth 5.7 mm. Form elongate, subparallel, depressed; color black, elytra yellowish-brown except humeri and suture; pubescence moderately dense, pale. *Head* coarsely, closely punctate; frons densely clothed with coarse, erect, pale hairs about as long as diameter of apex of antennal scape; vertex clothed with both erect and appressed pale hairs; antennae long, slender, approximately four segments extending beyond apex of elytra, last segment one-third longer than third, appendiculate. *Pronotum* wider than long (5.5:3.5), nearly as wide as elytra at base (5.5:6.0), sides obtusely rounded, widest a little behind middle; surface densely punctate but punctation obscured by a dense mat of appressed pale hairs intermixed with erect hairs similar in length to those of frons; prosternum densely punctate, vestiture similar to that of pronotum; mesosternum and metasternum densely clothed with suberect pale hairs; scutellum finely punctate, densely clothed with fine appressed silky pubescence. *Elytra* a little more than twice as long as broad (13.0:6.0), surface densely punctate, moderately coarsely so at base more finely toward apex, humeri black, suture narrowly black for from two-thirds to four-fifths of its length, sides subparallel from behind humeri to apical one-third, thence gradually narrowed to apices, apices sinuate-emarginate. *Legs* slender, densely punctate, sparsely clothed with pale hairs; anterior tibiae with a dense pad of short velvety pubescence along inner side; posterior tarsus with first segment about three times as long as second. *Abdomen* with sternites densely clothed with appressed pale pubescence, thinner toward posterior margin, intermixed with erect pale hairs.

Female: Length 16.5–18 mm., breadth 5–5.5 mm. Form broad, depressed; color black, elytra with a faint yellowish-brown spot between suture and lateral margin near base and a yellowish-brown streak along lateral margin from base nearly to middle. *Antennae* reaching well into apical third of elytra. *Pronotum* narrower than elytra (5.0:6.0), posterior disk with a polished median carina.

Holotype male (Mus. Ent. Calif. Acad. Sci.), from PALMDALE, CALIFORNIA, October 1, 1947 (G. P. McKenzie), *allotype* female (Mus. Ent. Calif. Acad. Sci.), same locality, October 14, 1947 (G. P. MacKenzie), and *paratypes*, three females, same locality, September 26, 1947, and October 1, 1947 (G. P. MacKenzie) and October 24, 1952 (Ray F. Smith). This last paratype is deposited in the collection of the California Insect Survey (Univ. Calif.), the remainder in the collection of Mr. MacKenzie. Dr. Smith's example was taken on *Chrysothamnus nauseosus gnaphalodes* (Greene) Hall.

This species apparently belongs to the *ater-hirtipes* complex. The male is suggestive of *hirtipes* but is larger (17.5 mm.) and differs in having the pronotum nearly as wide as the base of the elytra and the antennae surpassing the apices of the elytra by nearly four segments. The female suggests *ater* but is larger (16.5–18 mm.), with proportionally longer antennae and with pale areas near the base of the elytra.

Crossidius wickhami rhodopus Linsley, new subspecies

Length: 9.5–13 mm. (♂), 11–15 mm. (♀). Form, size and structure generally similar to *C. wickhami wickhami* Casey (= *C. truncatellus* Casey, new synonymy) described from Marysvale, Piute County, Utah, but differing in the reddish legs and antennae (black in *C. w. wickhami)*, denser pronotal pubescence, and the slightly different color pattern of the elytra. The female of *rhodopus* has a common dark median elytral infuscation extending from basal one-third or one-half toward the apices but rarely attaining them. About half of the males available have the elytra marked as in the female, the remainder have the elytra immaculate or the dark markings very faint. Available males of *C. w. wickhami* have a narrow dark sutural vitta as in the Casey type.

Holotype male (Mus. Ent. Calif. Acad. Sci.) and *allotype* female (Mus. Ent. Calif. Acad. Sci.) and five male *paratypes* from CONVICT LAKE, INYO COUNTY, CALIFORNIA, September 15, 1954 (G. P. MacKenzie). Additional *paratypes:* six females, Mammoth, Inyo County, California, August 28, 1946 (G. P. MacKenzie); one

female and one male, Mono Lake, Mono County, California, September 18, 1945 (G. P. MacKenzie); one male, Grant Lake, Mono County, California, August 28, 1946 (G. P. MacKenzie); eight males, Grant Lake, Mono County, California, September 5, 1948, on *Chrysothamnus nauseosus gnaphalodes* (Greene) Hall (P. D. Hurd and J. W. MacSwain); one male, Laurel Meadows, Mono County, California, 8500 ft. elev., August 13, 1936 (F. R. Platt); five males and one female, Benton Station, Mono County, California, September 4–5, 1950 (H. A. Hunt); and one female, Las Vegas, Nevada, October 30, 1952, on *Chrysothamnus nauseosus gnaphalodes* (Greene) Hall (R. F. Smith). *Paratypes* in the collections of Mr. G. P. MacKenzie, the Department of Entomology and Parasitology, University of California, Davis, and the California Insect Survey, University of California, Berkeley, California.

CROSSIDIUS RUFICOLLIS Linsley

This species is apparently associated with *Aplopappus acradenius bracteosus* (Greene) Hall in the San Joaquin Valley, California, and has been taken from this plant at the following localities: ten miles east of Buttonwillow, October 23, 1952, one male (H. T. Reynolds and R. F. Smith); two miles northwest of Mendota, October 20, 1952, eight males, five females (T. Leigh and R. F. Smith); Tipton, October 1, 1952, two males (F. T. Scott); one mile east of Tipton, October 21, 1952, three males, two females (T. Leigh and R. F. Smith); one mile north of Bakersfield, October 22, 1952, three males, two females (T. Leigh and R. F. Smith); five miles northwest of Bakersfield, October 22, 1952, four males, three females (T. Leigh and R. F. Smith), three miles south of Shafter, October 23, 1952, one male (H. T. Reynolds and R. F. Smith); two miles north of Kettleman City, October 20, 1952, sixteen males, nine females (T. Leigh and R. F. Smith); Kettleman City, September 28, 1952, fifteen males, fourteen females (F. T. Scott); Pixley, October 1, 1952, eight males (F. T. Scott); Visalia, October 28, 1952, four males, three females (F. T. Scott); and eight miles northwest of Wheeler Ridge, Kern County, October 23, 1952, two males (H. T. Reynolds and R. F. Smith).

CROSSIDIUS INTERMEDIUS LeConte

The typical form of this species has been taken from *Aplopappus tenuisectus* (Greene) Blake at Tucson, Arizona, October 7, 1952 (G. Bradt) and from *Aplopappus drummondii* (T. & G.)

Blake at Gila Bend, Arizona, October 27, 1952 (E. G. Linsley and R. F. Smith). The paler, less heavily marked type which occurs in southern California has been taken from *Aplopappus acradenius eremophilus* (Greene) Hall as follows: 2.8 miles east of Indio, Riverside County, October 23, 1951, forty-two males, two females (P. D. Hurd); five miles northwest of Indio, October 26, 1952, two males (E. G. Linsley and R. F. Smith); two miles northwest of Indio, six males, one female (E. G. Linsley and R. F. Smith); five miles west of Westmoreland, October 26, 1952, twenty-one males, six females (E. G. Linsley and R. F. Smith); Kane Springs, Imperial County, October 14, 1948, one male, one female (L. D. Anderson and H. T. Reynolds); Niland, Imperial County, October 24, 1951, thirty-five males, one female (P. D. Hurd); and five miles southeast of Bohns Corner, Imperial County, October 27, 1952, six males (E. G. Linsley and R. F. Smith).

CROSSIDIUS PULCHELLUS LeConte

This variable species is composed of many more or less distinctive populations, the exact status of which remains to be determined. A male from Wilcox, Arizona, September 4, 1942 (A. Mark Bliss) was associated with larvae apparently boring in the roots of *Gutierrezia lucida* Greene and a female was taken from the flowers of this same plant at Morongo Valley, San Bernardino County, California, October 26, 1951, by P. D. Hurd. Two females in the University of Arizona Collection from Jornado Experimental Range, thirty-five miles northeast of Las Cruces, New Mexico, elev. 4300 ft., August 25, 1939 (K. W. Parker) bear the label "larvae and pupae in roots of *Guiterrezia sarothrae* [Britt. & Rusby]."

CROSSIDIUS COCCINEUS (Casey)

This species was taken from *Chrysothamnus nauseosus mojavensis* (Greene) Hall, two miles south of Rosemead, California, October 24, 1952, three males, one female (R. F. Smith) and four miles east of Monolith, California, October 24, 1952, twelve males, fourteen females (R. F. Smith).

CROSSIDIUS MARGINATUS (LeConte)

This species, previously reported only from Baja California, has been taken in California by P. H. Timberlake as follows: San Diego, California, July 22, 1925, on *Eriogonum fasciculatum* Benth.; Riverside, California, September 6, 1936, on *Encelia farinosa* Gray; and Bear Valley, San Bernardino Mts., California, August, 1937.

FURTHER NOTES ON IRIS ORATORIA IN CALIFORNIA

(Orthoptera:Mantidae)

Ashley B. Gurney

Entomology Research Branch, Agricultural Research Service, United States Department of Agriculture, Washington, D. C.

Iris oratoria (Linnaeus), a distinctive mantid native to the Mediterranean area, has recently been recorded from California by Strohecker (1952), who stated that the identification was made by B. P. Uvarov. Strohecker's collection records date from 1940 and represent Fresno, Kern, Riverside, and Imperial Counties.

The present paper reports a 1937 record for this species and supplies additional information on distribution and recognition characters likely to be helpful to American students. For the records here reported and for other data I am grateful to John N. Belkin, of the University of California at Los Angeles, and to the collectors named below who cooperated with Dr. Belkin in making this information available.

New records for *Iris oratoria* (L.) from Riverside and Imperial Counties, California, based on specimens seen by Dr. Belkin except for the one collected by Dr. Tinkham, are as follows:

Coachella Valley, October, 1937 (R. B. Cowles), 1 male (U.C.L.A.); Indian Wells, October 4, 1952, at light (R. X. Schick), 2 males (U.C.L.A. and U.S.N.M.); same, April 24–25, 1953 (R. H. Orson), 1 female (U.S.N.M.); Indio, October 15, 1951 (L. D. Anderson), 1 female (Citrus Expt. Sta.); same, April 24, 1953 (W. A. McDonald), 1 male (U.C.L.A.); same, May 3, 1953 (E. R. Tinkham), 1 male (used by Paramount Studios); 3 miles west of Cabazon, October 22, 24, 1952 (E. G. Linsley, et al), 2 females (Citrus Expt. Sta.); El Centro, September 3, 1952 (H. T. Reynolds), 1 female (U.C.L.A.).

Dr. Belkin has observed at Riverside, a caged female which had been swept from cotton at El Centro, Imperial County, by H. T. Reynolds on September 3, 1952. While in captivity this female laid at least 10 egg masses. She died December 1 and was preserved (U.C.L.A.). Mantids presumed to be *Iris* were reported by Dr. Reynolds to be common in the cotton fields of Imperial County. In addition to the above specimens, the Los Angeles County Museum has a female collected by Dr. J. A. Comstock in 1933 which, according to Dr. Belkin, is definitely this species though in poor condition. The exact date of collection cannot be determined, nor the locality, but Dr. Belkin has checked certain museum accession entries which attest to the correctness of the 1933 date.

Iris oratoria is widespread in the Mediterranean countries. Beier (1935:107) listed northwest Africa, Spain, southern France, Sardinia, Sicily, Greece, and Asia-Minor. Ramme (1951) specified the Balkans, Macedonia, Anatolia, and Syria. Linnaeus (1758:426) originally described this insect from material collected by E. Brander in Africa. Subsequently Uvarov (1923) has pointed out that since Brander was a Swedish Consul stationed at Algiers, this locality may be interpreted as the type locality.

It is well known that the egg cases (oöthecae) of mantid species frequently are carried accidentally in commerce. Therefore, certain introductions probably have been made by this means, and it appears likely that *Iris oratoria* was introduced into the United States in this manner. Several examples of Old World insects, which have been established in California since the advent of widespread air travel, suggest the increased ease with which introductions may occur. Strohecker *(op. cit.)* records a small Palearctic katydid, *Phaneroptera quadripunctata* Brunner, from central and south-central California, and in 1950 I recorded *Euborellia cincticollis* (Gerstaecker), a west African earwig. from southern California (Gurney, 1950).

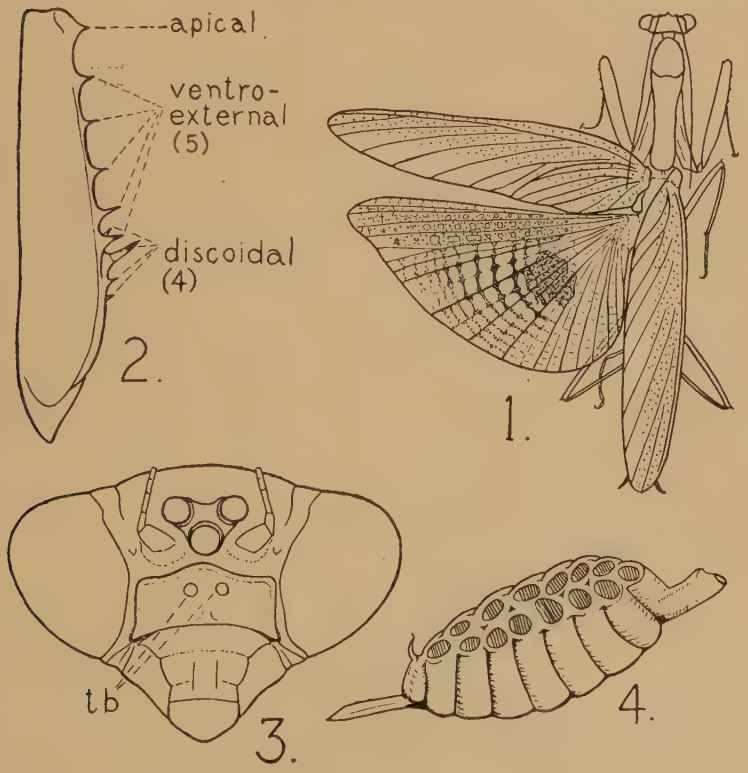
The features illustrated (figs. 1–3) distinguish this mantid from other North American species, especially the nature of the facial shield, the five ventro-external spines on the front femur (instead of four as in *Stagmomantis)*, and the color pattern of the hind wing. The males of the minor mantid *Litaneutria minor* (Scudder) frequently have a blackish-violet spot on the wing (Gurney. 1951, pl. 5, fig. 2), somewhat suggesting the one occurring in *oratoria,* but *Litaneutria* may be distinguished by the narrower head, the more delicate general structure, and the decidedly brachypterous females, in addition to the lack of tubercles on the facial shield and the presence of only four ventro-external spines on the front femur.

For a key to the five genera of Mantidae previously known from the Southwest, students are referred to Ball, Tinkham, et al (1942:268). A key to the world genera of Mantinae is presented by Beier (1935), who attached much importance to the presence in *Iris* of five ventro-external spines on the front femur. The species of *Iris* were reviewed by Uvarov (1931), and several forms have been described since that time, bringing the total species and sub-

species listed by Beier (1935) to 14, of which several are of uncertain status.

A brief description of *Iris oratoria* is as follows:

Male.—Eyes broadly rounded (fig. 3); ocelli prominent, each ocellus distinctly circular rather than elliptical; facial shield slightly more than twice as broad as high, the upper margin distinctly marginate, the median third of upper margin broadly convex, a pair of short blunt tubercles on disc of shield slightly above middle and somewhat closer to each other than to respective ends of shield, a moderately sharp tubercle at each latero-anterior angle of shield; antennae filiform, reaching about to base of abdomen. *Pronotum* four times as long as greatest width, margins smooth except for traces of denticulation along anterior third. Front tibia lacking dorsal spines; ventro-external margin of front femur with five strong spines in



EXPLANATION OF FIGURES

Figs. 1–3, *Iris oratoria* (L.), male from Indian Wells, Calif. 1. Habitus, with opaque area of tegmen and brick-red area of radial field of wing shown stippled; 2. External face of front femur; 3. Head. Fig. 4, Egg mass of *oratoria*, redrawn from Morales. *tb*—median tubercles of facial shield.

addition to an apical one (fig. 2); middle and hind femora unarmed except for a single slender genicular spine each on the cephalic side. *Tegmen* (fig. 1) about four times as long as maximum width, apex narrowly rounded, the costal half opaque, posterior half transparent, reaching about to or somewhat surpassing apex of abdomen, the costal margin lacking cilia. Wing with much of basal two-thirds of radial field dull brick red, with small transparent windows in the middle of many cells; anal field with irregular shining bluish-black blotch about as broad as the width of the head located at a distance from the base about equal to a third the wing length; apical half of anal field yellowish, with concentric blackish fasciae.

Female.— Averaging somewhat more robust than male. Head differs from male mainly in the smaller, scarcely protuberent ocelli, separated from each other by nearly twice the diameter of one ocellus; pronotum averaging stouter and the marginal denticulation more developed; tegmina shorter than abdomen, usually covering one-half to threee-fourths of abdomen, apex broadly rounded; hind wing subquadrate, marked as in male.

Habitus illustrations of males are given by Chopard (1947, pl. 3, color) and Morales (1947), of females by Beier (1935, pl. 4, color), Chopard (1951), and Morales (1947).

I have seen only three California specimens of *Iris oratoria*, a male from Coachella Valley and a pair from Indian Wells. These specimens are larger than most published size records for *oratoria*. It may be observed that Uvarov (1923:60) pointed out that specimens from the eastern Mediterranean area seem larger and more heavily marked on the wings than others. This fact suggests that if the size in the California population proves to be consistently large then this population may be related to the particular population from which the introduced stock originated.

Four males and two females, from Coachella Valley, Indian Wells, El Centro, and Indio, measured by Dr. Belkin or myself, have the following size ranges (length in millimeters): (Males) Body, 51–53, average 52.2; pronotum, 13–15.5, average 14.4; tegmen, 31.5–34, average 32.6. (Females) Body 52–53, average 52.5; pronotum, 16–16, average 16; tegmen, 22–22, average 22. Chopard (1943, 1951, and other papers) gives the following respective ranges for the same measurements: (Males) 28–37, 8–11.5, and 22.3; (Females) 34–47, 11–16, and 15–22. The same measurements given by Giglio-Tos (1927) for males (27–46; 8–14.5; 22–35) have greater maximum extremes than those of Chopard and more nearly agree with the California specimens, but the size extremes given by him for females are not as broad as those of Chopard.

The cerci of the male deposited in the U. S. National Museum have at least 12 segments. Uvarov (1923:62, fig. 1) has described and figured males of *oratoria* with nine-segmented cerci. A female examined has at least 11 segments, and it is evident that the segmentation is less clearly indicated toward the base of the cercus than in the apical half. This apparent discrepancy, the unusually large size of the specimens measured, and apparent differences in egg masses should alert entomologists to the possibility that further studies may show the California population to be distinct from typical *oratoria*.

The biology of *Iris oratoria* is apparently typical of mantids living under temperate conditions, with a winter diapause passed in the egg stage, unlike the related *I. deserti* Uvarov of the North African deserts, which according to Karsakoff (1934) has a diapause in the nymphal condition.

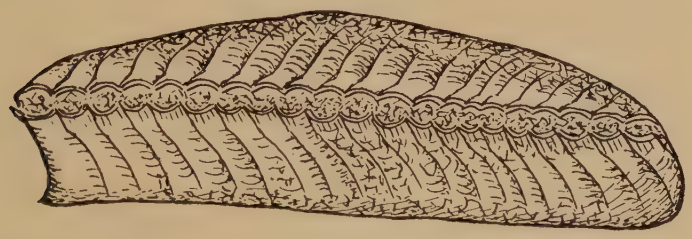


Fig. 5, Oötheca of *Iris* from California, dorsolateral view. Length, 20 millimeters.

Old World examples of the oöthecae of *oratoria* have been illustrated by Chopard (1938, fig. 197) and Morales (1947, fig. 40), and Morales' figure is here shown (fig. 4). Oöthecae from California have a different appearance (fig. 5), however. The most noticeable difference is a distinctive emergence groove. Three Californian oöthecae examined are 10, 16, and 20 millimeters long, respectively, and are 6 to 7 mm. wide at the base and about 5 mm. high. There are about 6 longitudinal rows of eggs, 3 on each side slanting inward and upward toward the emergence groove. Individual eggs in the outer row give a convex appearance when not covered by dried "froth". The emergence groove is formed by a brief projection of parchment-like material lining each side of the passageway where each set of approximately six nymphs work their way to the surface. The groove is loosely filled with dried

"froth". The number of eggs per longitudinal row is 10, 15, and 20, respectively, in the oöthecae examined; the total number of eggs thus varies from about 60 to 120.

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THE MORPHOLOGICAL AND TAXONOMIC SIGNIFICANCE OF THE BASAL ABDOMINAL SEGMENTS IN HEMIPTERA-HETEROPTERA

Ryuichi Matsuda
Stanford University, Stanford, California

In a recent study of the generic classification of the Aradidae, important characters were discovered in the basal abdominal tergites. Such characters have been overlooked in the past because the parts are concealed beneath the wings in most museum specimens. Recent morphological studies dealing with the first and second abdominal segments of Hemiptera have been concerned almost exclusively with the ventral side of the segments in question.[1] [2]

On the basis of the ventral segments, it has been customary to count the visible first segment as the second segment, the true first segment presumably being completely lost. However, in the present study, which included several families of Hemiptera, it was found that the first and second dorsal abdominal segments vary in degree of reduction and fusion, and in some the true first and second segments are clearly separated.

The degree of fusion, the position, and the form of the sutures have proved to be of taxonomic importance in the Aradidae. In the sub-family Mezirinae, in which the first and second segments are clearly separated, each genus has a particular structure. The characters seen are very different from those of the succeeding segments and are very constant within a genus. This fact has helped greatly in determining genera. Details of this will be discussed in the forthcoming generic classification of the Aradidae by Usinger and Matsuda.

Miridae were also examined systematically with the help of Dr. Josè Carvalho, and it was found that the particular structure of the first and second abdominal tergites is more or less constant within each tribe or subfamily. This was especially pronounced in the tribe Bryocorini of the Bryocorinae. On the basis of preliminary evidence it is difficult to say whether or not each particular structure occurs at the generic level in the Miridae, but the indication thus far is that each particular structure is a higher

[1] Brindley, 1938, The metathoracic postcoxal bridge of Heteroptera. Proc. Royal Ent. Soc. London, (A) 13:103-106.

[2] Larsen, 1945, Der thorax der Heteropteren skelett und muskulatur. Lunds Univeritets Arsskrift. N.F. Avd. 2. 41(3):1-110.

group character in the Miridae. Apparently the Miridae do not offer good material for study of the dorsal abdominal characters because of their fragile bodies and the resulting irregular secondary sutures that appear on the surface of the segments with which we are concerned. In some families, for instance in Reduviidae, the first and second segments are incompletely fused, and the resulting structure in these segments assumes a bizarre shape. A comparison of one species of *Triatoma* and *Paratriatoma hirsuta* Barber shows a very distinct difference in structure in the incompletely fused first and second segments. Reduviidae apparently offer good material to test the applicability of this discovery.

Based on an extensive study of the Aradidae, less extensive observation on the Miridae and a cursory, rather unsystematic survey of other families, it is suggested that each particular pattern of fusion or modification in the first and second abdominal tergites and the resulting structure occurs: 1) at the subgenric or generic level, or 2) in more than one genus within a tribe or a subfamily, or 3) in more or less constant form within a tribe or subfamily.

It should be noted that the first segment sometimes is not directly concerned in producing a particular structure as is evidenced in many genera of the Mezirinae. Also there are cases where the second segment is not directly involved in producing the particular structure as is evidenced in many genera of Reduviidae. Occasionally the third segment contributes towards the formation of a particular structure.

Presumably there will be cases in which the characters in question do not fit any of the three levels stated above. Nevertheless, it would appear to be worthwhile to investigate this particular part of the body from the view point of systematics. If we once have a constant generic, tribe, or subfamily character, this helps greatly in straightening out doubtful species or genera. It should also be mentioned that other parts of the body beneath the hemelytra offer a possibility for characters of higher taxonomic units.

It is a pleasure to record my indebtedness to Professor R. L. Usinger for his assistance in carrying on the present study, to Dr. J. Carvalho and Mr. J. D. Lattin for their help in testing the material other than the Aradidae, and also to Professor G. F. Ferris of Stanford University for reading the manuscript.

THE EGGS OF CORIMELAENA VIRILIS (McATEE AND MALLOCH)

(Hemiptera: Cydnidae: Corimelaeninae)[1]

John D. Lattin

University of California, Berkeley

One of the first hazards to which an insect is exposed is that of successfully emerging from the egg. Various groups have evolved different methods for the successful completion of this task. This paper will treat one type of egg burster found in the Order Hemiptera.

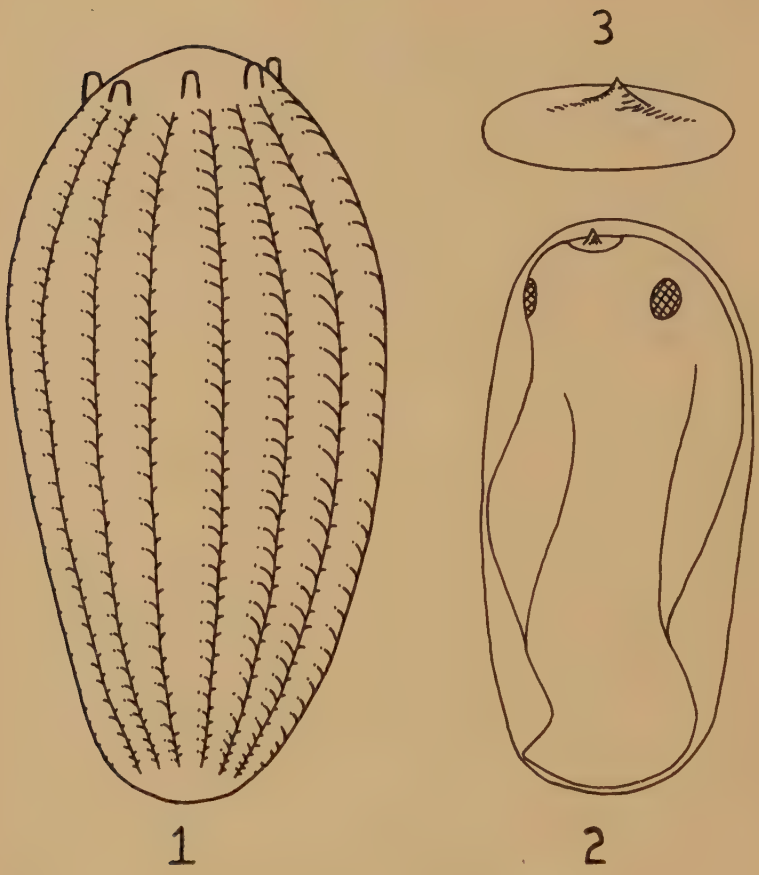
Aside from a very brief mention by Webster (1884), no complete description of the eggs of any Corimelaeninae has been noticed. Boselli (1932) described the egg of *Sehirus sexmaculatus* (Rbr.), a species which belongs to the other subfamily of Cydnidae. He illustrated the fully developed embryo and the egg burster.

The eggs of *Corimelaena virilis* were taken on a species of *Nicotiana* in eastern California. The eggs were laid singly on their side towards the top of the plant and on the underside of the leaves near the midrib. The eggs of the Cydininae, the other subfamily of Cydnidae, are laid in ball-like clusters in the ground and are brooded by the female. The other families of Pentatomoidea, as far as known, lay their eggs in clusters of 4–40 with the individual eggs laid upright so that the egg mass resembles a series of small kegs.

The egg of *Corimelaena virilis* is white, 1.08 mm. in length, roughly ovoid with one side slightly flattened. The egg tapers posteriorly and the chorion is fluted longitudinally; the anterior end bears a ring of 9 chorionic processes which are peg-like. There is no well defined opercular suture although the opercular area is defined by the processes (fig. 1).

The egg burster appears early in the embryonic development as a small stout spine slightly behind the vertex of the head (fig. 2). This spine is situated in a well defined sclerotized disk which fits cap-like over the posterior portion of the head (fig. 3). This disk is contained in the embryonic cuticle. There is another membrane that surrounds the embryonic membrane that is believed by some to be the serosal membrane. When hatching takes place, the egg splits longitudinally across the anterior end, initiated

[1] This paper was presented at the annual meeting of the Entomological Society of America at Los Angeles, California on December 9, 1953.



EXPLANATION OF FIGURES

Fig. 1. Egg of *Corimelaena virilis* (McAtee and Malloch), side view showing fluting and chorionic processes. Fig. 2. Partially developed embryo within outer membrane showing egg burster. Fig. 3. Enlargement of egg burster.

by the emerging nymph pressing against the burster which in turn splits the chorion. At this time only a single membrane is apparent. The exact fate of one of the membranes is unknown. As mentioned earlier, Boselli showed the egg burster of one of the Cydninae and it is exactly like that found in *Corimelaena*. All of the other Pentatomoidea known have a T-shaped burster. In the latter a well developed opercular cap is present and emergence takes place by the nymph pushing the burster against the cap which in turn

hinges back, allowing the nymph to escape. Thus it seems clear that the Cydnidae, at least with regard to the egg burster, is a well defined family within the super-family Pentatomoidea. Certain other morphological characters seem to bear this out.

In other groups of Hemiptera where egg bursters are known, various modifications have taken place. In the Coreioidea, the burster closely resembles that type found in the Cydnidae. It consists of a single, blunt spine borne by a sclerotized hood-like structure. The Cimicidae, according to Sikes and Wigglesworth (1931), have an egg burster consisting of a V-shaped series of spines on the embryonic cuticle in the vicinity of the vertex of the head.

Our knowledge of egg bursters is far from complete, but there are indications that these structures may be useful in providing additional systematic characters which will be useful in determining the correct relationships of many groups.

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RELEASES OF RECENTLY IMPORTED INSECT PARASITES AND PREDATORS IN CALIFORNIA, 1952-53

C. P. CLAUSEN

Department of Biological Control, University of California, Riverside

There is given below a complete record of the first field releases in California of a series of insect parasites and predators, listed under their respective hosts, recently imported by the Department of Biological Control. The year of release is 1953 unless otherwise indicated. The publication of this record seems desirable in order to facilitate identification of any of the species should they be taken by collectors in the future.

Host and Parasites or Predators	*Origin*	*Area or County of Release*
HARRISINA BRILLIANS, Barnes and McDunnough		
Apanteles sp. "B"	Mexico	San Diego
Haltichella sp.	Mexico	San Diego
Phorocera sp.	Arizona, Mexico	San Diego
GRAPHOLITHA MOLESTA (Busck)		
Horogenes sp. * [1]	China	Orange
COLIAS EURYTHEME Boisduval		
Apanteles flaviconchae Riley	Connecticut	Fresno Merced Stanislaus
PROTOPARCE SEXTA (Johannsen)		
Apanteles congregatus (Say)	Connecticut	San Joaquin Solano Riverside Orange
ANASA TRISTIS (DeGeer)		
Trichopoda pennipes Fabricius (squash bug strain)	Connecticut	Riverside San Diego
CIRCULIFER TENELLUS (Baker)		
Aphelinoidea sp. 2	North Africa	General
Lymaenon sp. "A"	Spain, N. Africa	General
Lymaenon sp. "B"	Spain, N. Africa	San Bernardino
Polynema sp. "A"	Spain, N. Africa	General
AONIDIELLA AURANTII (Maskell)		
AONIDIELLA CITRINUS (Coquillett)		
Aspidiotiphagus sp. "N-270"*	Formosa	Riverside San Bernardino Tulare
Microweisea coccidivora (Ashmead)*	Florida	So. Calif. Tulare
Prospaltella sp. "P"*	Formosa	Riverside San Bernardino Tulare
Scymnus sp. *		So. Calif.
LEPIDOSAPHES FICUS (Signoret)		
Archenomus sp. [1]	France	Merced Fresno
ASPIDIOTUS LATANIAE Signoret		
Aphytis sp. "Q"	Eritrea	So. Calif.
ASPIDIOTUS PERNICIOSUS Comstock		
Habrolepis oppugnati Silvestri	Eritrea	Riverside San Diego
PARLATORIA OLEAE (Colvée)		
Aphytis maculicornis (Masi)* Egyptian strain	Egypt	Fresno

Persian strain	Iran	General
Spanish strain	Spain	San Joaquin Valley
Aspidiotiphagus sp. *	Iran	San Joaquin Valley
Cybocephalus sp.	Spain	San Joaquin Valley
COCCUS HESPERIDUM Linnaeus		
COCCUS PSEUDOMAGNOLIARUM (Kuwana)		
LECANIUM CORNI Bouché		
LECANIUM KUNOENSIS (Kuwana)		
SAISSETIA OLEAE (Bernard), etc.		
Coccophagus eleaphilus Silvestri	Eritrea, Morocco	General
Coccophagus eritreansis Compere	Eritrea	So. Calif., Tulare Contra Costa
Coccophagus nigritus Compere	Eritrea	Riverside
Diversinervus elegans Silvestri	Eritrea	General
Exochomus floralis (Motschulsky)	Morocco	Riverside, Tulare Contra Costa
Hyperaspis sp.	Eritrea	General
Metaphycus flavus Howard	Morocco	General
Metaphycus sp. "X"	Eritrea	General
Metaphycus sp. "Y"	Eritrea	General
Platynaspis (?) sp.	Eritrea	General
SAISETIA OLEAE (Bernard)		
Coccophagus baldassarii Compere	Eritrea	Ventura Riverside San Joaquin
COCCUS PSEUDOMAGNOLIARUM (Kuwana)		
Metaphycus orientalis Compere	Japan	Tulare
LECANIUM KUNOENSIS (Kuwana)		
Brachytarsus kuwanai Yuasa	Japan	Contra Costa
Encyrtus infidus Rossi (?)	Japan	Contra Costa
Microterys sp.	Japan	Contra Costa
COCCIDAE (miscellaneous)		
Chilocorus sp. near *distigma* Klug	Eritrea	General
PLANOCOCCUS CITRI (Risso)		
Bothriocraea sp.[2]	Trinidad	Santa Barbara
Pseudaphycus n. sp.	Eritrea	Santa Barbara San Diego
METATETRANYCHUS CITRI (McGregor)		
Stethorus sp.	Eritrea	Santa Barbara
Stethorus sp.	Morocco	San Diego Santa Barbara
EOTETRANYCHUS SEXMACULATUS (Riley)		
Stethorus punctum (LeConte)	Connecticut	Santa Barbara

* First releases made in 1952.

[1] Received through U.S.D.A., Bureau of Entomology and Plant Quarantine.

[2] Received through Commonwealth Institute of Biological Control.

RECORDS OF WATER BEETLES FROM MANCHURIA AND SIBERIA

(Coleoptera: Dytiscidae, Hydrophilidae)

HUGH B. LEECH

California Academy of Sciences, San Francisco

In the July, 1946 number of the Annals and Magazine of Natural History (not actually published until June, 1947), J. Balfour-Browne gave a report on the Manchurian water beetles I had purchased in 1938–40 from their collector, Michael Weymarn. Unknown to us, Per Brinck of Lund had also obtained part of Weymarn's catches, and his paper was published in December, 1946.

The two papers list 84 species and subspecies of Haliplidae, Noteridae, Dytiscidae, Gyrinidae and Hydrophilidae, but the total is subject to change for it is clear that the authors are not always in agreement in their identifications, and some of Brinck's records were taken from the literature. The Hydrophilidae in Brinck's Manchurian collection were determined by the late A. d'Orchymont.

The present paper records some material not available before[1], adds one species omitted by error from Balfour-Browne's list, and gives keys to a few species. All the beetles are from Manchuria, except one *Hydrochara liber* (Sharp) from Siberia, which was loaned by Henry Dietrich of Cornell University.

DYTISCIDAE

ILYBIUS LATERALIS (Gebler)

Harbin, 16.viii.1940 (M. A. Weymarn)

ILYBIUS CINCTUS Sharp and/or I. ANGUSTULUS Régimbart

Harbin, 16.viii.1940 (M. A. Weymarn), 8♂♂, 15♀♀; Chenghoutze station near Harbin, 18.vi1939 (A. S. Loukashkin), 2♂♂, 5♀♀; Mukden, 14.viii. 1923 (E. C. Van Dyke), 3♂♂, 9♀♀.

These small yellow-margined species, the *apicalis* complex, are greatly in need of revision, as remarked by Brinck. On the basis of specimens identified for me by Balfour-Browne, I offer the following key. In his text he remarks on the difficulty of separating *apicalis* and *angustulus*, yet from the material before me I can not distinguish between *angustulus* and *cinctus*, both sensu Balfour-Browne.

1. Hind coxal plates with fine irregular, impressed lines and punctures, in addition to their regular surface sculpture; apex of prosternal process not at all acuminate, almost blunt; hind tarsi of male finely margined along outer edge; parameres broadly rounded apically (fig. 10 in Balfour-Browne's paper); sixth abdominal sternite of female barely at all compressed but with a weak triangular incision at apex.....*lateralis*
– Hind coxal plates with fine regular surface reticulation only; apex of prosternal process acuminate; hind tarsi of male not margined externally; parameres rather narrow, apically produced into a long process (fig. 8 in Balfour-Browne's paper); sixth abdominal sternite of female slightly compressed but not incised at apex.....2
2. Distance between hind coxal plate and middle coxa narrow, equal to ¼ of width of hind coxal plate measured along same line; median line of prosternum and its process less angulate, much more transversely rounded, less laterally compressed; pale margin of elytra narrower at base, where it is about as wide as a front tibia, or about ¾ the width of a compound eye .....*apicalis*
– Distance between hind coxal plate and middle coxa greater, equal to a little more than 1/3rd width of hind coxal plate; median line of prosternum and its process more sharply angulate, less rounded, more laterally compressed; pale margin of elytra broader, fully as wide as a hind tibia, slightly wider than a compound eye.....*cinctus* and *angustulus*

RANTUS SUTURALIS (MacLeay)

Chenghoutze station near Harbin, 18.vi. 1939 (A. S. Loukashkin), 1♀.

ERETES STICTICUS (Linnaeus)

Chenghoutze station near Harbin, 18.vi.1939 (A. S. Loukashkin), 1♂.

HYDROPHILIDAE

HYDROCHARA AFFINIS (Sharp)

Mukden, 13.viii.1923 (E. C. Van Dyke), 3♂♂, 7♀♀; Chenghoutze station near Harbin, 18.vi.1939 (A. S. Loukashkin), 2♂♂.

HYDROCHARA LIBER (Sharp)

Hydracharis libera Sharp, 1884. Trans. Ent. Soc. London, 1884 (4): 450.

This species was inadvertently omitted from Balfour-Browne's list. The following specimens are before me:

Weishaha, vi-vii. 1939 (M. Weymarn), 2♂♂, 4♀♀; Hsiaoling, vii. 1939 (M. Weymarn), 1♂. 1♀; Mukden, 13. viii. 1923 (E. C. Van Dyke), 1♀. Also 1♂ labeled "Krasnaja Rjetschka bei Chabarowsk, leg Babiy, 1917" (= Khabarovsk, Siberia), from the Cornell University collection.

H. liber may be separated from *H. affinis* as follows:

1. Apex of sternal keel blunt, laterally compressed, carinate, not reaching beyond middle of 1st abdominal sternite; legs reddish; parameres of male genitalia produced inward and almost touching, just before apices. .....*affinis*
– Apex of sternal keel spinose, acuminate, reaching to hind margin of 1st abdominal sternite; legs black or piceous; parameres straight, dorsoventrally flattened and blade-like apically.....*liber*

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[1] Note also **Haliplus (Haliplinus) steppensis** Gupignot, described as allied to **H. apicalis** Thomson; and **Helophorus (Empleurus) pardakoffi** Stocklein, near **H. rufipes** Bosc. In each case the type locality is "Charbin", Manchuria. These species are described on pages 108 and 268, respectively, of Entomologische Arbeiten aus dem Museum G. Frey, Bd. 5, Heft 1; published April 10, 1954.

JURUPA ENTOMOLOGY CLUB

The Jurupa Entomology Club was organized at the University of California at Riverside on October 16, 1953. The purpose of the club is to promote the study of fundamental entomology and to cultivate friendly relations among those interested in the science of entomology. Membership is open to anyone interested in the study of insects. Regular meetings are held on the U.C.R. campus on the first Wednesday (7:30 p.m.) of each month. In addition to the monthly meetings the organization sponsors field collecting trips. During the past year the group has gone on outings to Andreas Canyon, Deep Creek, Wrightwood, Cottonwood Springs, and twice into southern Arizona. The evening meetings have contained many discussions on insect collecting, classification, ecology, and biology and numerous specimens have been exhibited. Also, several outside speakers and movies have been presented at the meetings. During the first year the club, with P. H. Timberlake as president, has grown from 15 to about 25 active members.—L. D. Anderson, *Secretary*.

A NEW TACHINA FLY OF ECONOMIC IMPORTANCE

Maurice T. James

State College of Washington, Pullman

The description of the following species is being published at this time in order to provide a name for the recording of biological information.

Plectops amplicornis James, new species

Male. Almost wholly black in ground color, including the legs, antennae and palpi, the frontale at most with a trace of reddish in some specimens. Vertex about 0.42, front at antennal base about 0.55, head width; frontale about equal in width to each parafrontale. Inner verticals very long and strong; outer verticals, postocellars, and proclinate ocellars well developed; one pair of proclinate and one of reclinate frontoorbitals and four of frontals, the upper pair cruciate, the lowest two at or below the antennal bases. Facials hardly bristly, at most with a few setulae above the vibrissa and sometimes a few scattered ones reaching not more than to the middle of the face. Third antennal segment exceptionally large (Fig. 1), its maximum width

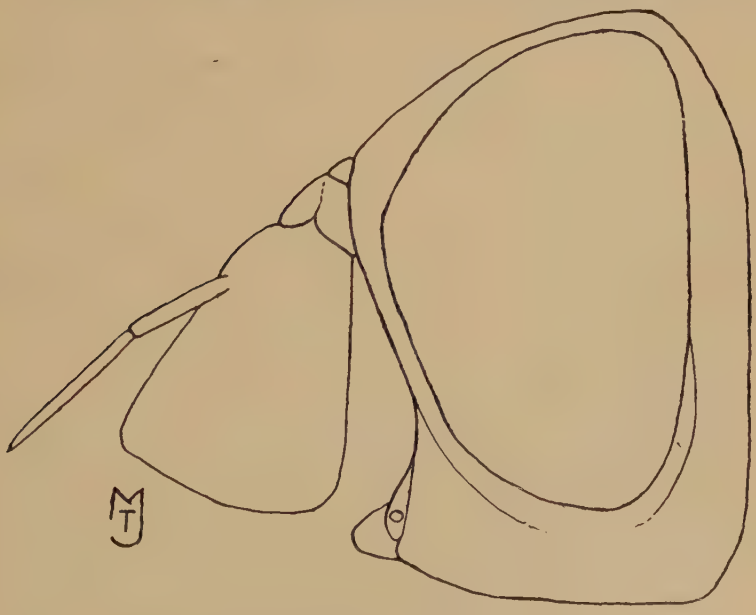

Fig. 1. Lateral view of head of *Plectops amplicornis.*

about 0.8 its length. Eyes practically bare, at most a few scattered hairs evident under high magnification. Frontale opaque, parafrontale subshining through a brownish pollen, parafacials more distinctly obscured by the pollen. *Thorax* mostly subshining, the mesonotum and scutellum with thin brownish pollen, the humeri and the pleura whitish-pollinose, the propleura and parts

of the mesopleura and pteropleura completely obscured by the pollen when viewed in certain lights. Wing grayish-hyaline; vein R_1 bare; vein R sometimes with a small setula dorsally before the origin of Rs, and vein Rs with two strong setulae, one on the upper and one on the lower surface, at its furcation; veins brown, more yellowish basally, squamae yellow, the lower ones tending to brownish-yellow; halteres yellow. *Abdomen* shining, the pollen very thin and scattered except for a band at the base of terga two, three, and four, where the pollen is dense and white; these bands are contracted, sometimes interrupted, medially on the dorsal surface, and become somewhat broader and less definitely outlined on the ventral aspects of the terga. Genitalia subshining; forceps small, about twice as long as broad, bluntly rounded apically.—Length, 4 mm.

Female. Similar to the male; the vertex and front broader (0.47 head width at vertex, 0.55 at antennal insertion), and the third antennal segment is narrower (maximum width about 0.7 length). The front tarsi, as in male, are not expanded.

Holotype male reared from *Lotisma trigonana* Walshingham which was taken in October at VAUGHN, WASHINGTON, by E. P. Breakey on the evergreen huckleberry, *Vaccinium ovatum* Pursh.; emerged December, 1951 at Puyallup, Washington. State College of Washington Type Collection No. 175. *Allotype female,* same data. *Paratopotypes,* 7 males, 1 female, same data. *Paratypes,* 1 female, Friday Harbor, Washington, June 1, 1906 (J. M. Aldrich); 1 female, Guemes Island, Washington, July 13, 1905 (Aldrich).

This species traces to the genus *Plectops* in the Curran (1934) and in the Townsend (1936) keys; it fails to run in the Coquillett key (1897), because the setulae at the apex of vein R_1 are absent. There are five species in the collection of the United States National Museum under the name *Plectops*. These are: *melissopodis* Coquillett (the genotype), *usitata* (Coquillett), *aenea* Coquillett, *pruinosa* Malloch, and *manca* Greene.

P. manca differs from *P. amplicornis* in having the apical part of vein M_{1+2}, beyond its bend, evanescent; *P. melissopodis*, *usitata*, and *pruinosa* have the head and mesonotum cinereous tomentose; and *P. aenea* has the head and anterior part of the mesonotum cinereous, whereas the rest of the mesonotum is brassy-tomentose but more yellowish than in *amplicornis*. The third antennal segment of *P. amplicornis* is broader than in the other species, the female *amplicornis* being, for example, comparable in this respect to the male *melissopodis*.

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A NEW SPECIES OF WASP OF THE GENUS SOLIERELLA FROM SOUTHERN CALIFORNIA

(Hymenoptera: Sphecidae)

FRANCIS X. WILLIAMS

Research Associate, Department of Entomology
California Academy of Sciences

Solierella weberi Williams, new species

Male.—Length 4 mm. Black; head and thorax subopaque, abdomen shining; mandibles reddish yellow beyond their middle, dark reddish apically; tarsi and spurs brownish. Puncturation dense, finer on abdomen. Mandibles very slightly emarginate beneath, malar space about one-half basal width of mandibles; clypeus depressed anteriorly to end as a spike; frons rather gibbous, with a faint median impressed line ending anteriorly as a wedge and thence as a carina to between the antennae; ocelli in slightly less than a right-angle triangle, the lateral ocelli distant by a little more than their greatest diameter from the compound eyes; antennae only moderately stout, gently clavate, segments 3 and 4 subequal, segment 13 very short, subconical, shining, outwardly a little longer than segment 12. Disc of propodeum broadly truncate triangular, reticulate, with a delicate carinate groove, not margined laterally by a carina. Submarginal cells 1 and 2 each receiving a recurrent vein towards their tip; basal and transverse-median veins interstitial. Pile moderate and silvery.

Holotype, male, from RIVERSIDE, CALIFORNIA, September 26, 1948 (P. W. Weber), in collection of the California Academy of Sciences. In fine condition. The paratype, also a male, was collected in Riverside, September 28, 1948 (P. W. Weber). It is 3.75 mm. long and has the disc of the propodeum coriaceous, but like the holotype has no bounding carinae, while in the forewings the transverse-median vein is slightly basad of the basal vein. Female is unknown.

At first sight this species suggests the common and widely distributed and variable *Solierella peckhami* (Ashmead), but is separated from the latter by the very short segment 13 of the antennae; in *S. peckhami* male, segment 13 is nearly equal to the sum of segments 10, 11 and 12. The non-margined propodeal disc

Figure 1.—Four terminal segments of antenna of *Solierella weberi*, paratype.

of the new species may not be a reliable character.

Named for Mr. P. W. Weber, entomologist with the Board of Agriculture and Forestry, Territory of Hawaii. I am indebted to Mr. Weber for submitting to me this and other species of *Solierella* for study.

Book Review

INSECT FACT AND FOLKLORE. By Lucy W. Clausen. Macmillan Co., New York. xiv+194 pp. 1954. Price $3.50.

This is an easy to read little book that was written primarily to introduce laymen to the field of entomology. In order to achieve this purpose the author has relied heavily upon those anecdotes, stories, superstitions, verses, and bits of information which would prove both interesting and informative to the general reader. Insects as they are utilized as a source of food by man and especially as they play a role in the folklore of various people are dealt with. She has infused just enough technical entomology to make the text comprehensible and to provide the reader with an appreciation of insects and what they are.

After the first chapter, which orients the reader to entomology, each chapter pertains to a group of insects, i.e., moths and butterflies, beetles, orthopteroids, flies, bees, ants, wasps, bugs, dragonflies and damselflies, termites, fleas, and lice. Also included is a chapter on insect-produced plant galls. The last chapter is devoted to a discussion of entomology as a science, in regard to its past history, present endeavors and achievements, and future possibilities.

The book will probably serve well its intended purpose. Indeed even the research entomologist and teacher will find much that is new and interesting. As might be expected in such a compilation of facts and stories, some errors have found there way into it. However, these are few in number and do not detract seriously from the over-all authenticity of the book nor from its interest. The illustrations which are sprinkled through the pages are not styled in the explanatory manner of scientific drawings, but convey adequately the general facies of the insect.—Jerome G. Rozen, Jr., *University of California, Berkeley.*

NEW RHYNCHOPHORA FROM WESTERN UNITED STATES

(Coleoptera: Curculionidae)

Elbert L. Sleeper

Department of Zoology and Entomology,
Ohio State University, Columbus

The following species new to science were found in material sent to the author for identification by C. A. Frost (C.A.F.) of Framingham, Massachusetts, and H. B. Leech of the California Academy of Sciences, San Francisco (C.A.S.). Additional material represented in the collection of the writer has been included (E.L.S.). The author is indebted to both for type material.

Podapion alexanderi Sleeper, new species

Male—Elongate, subcylindrical, parallel; black, opaque, antennae reddish brown; sparsely clothed with short, fine, prostrate, pale pubescence.

Rostrum as long as pronotum, very strongly curved, smooth shining, finely, sparsely punctulate. Head convex, coarsely punctate, rugose between eyes; each puncture with a very short fine seta. *Prothorax* slightly wider than long, sides evenly rounded, feebly constricted at apex; pronotum coarsely punctate, intervals between punctures finely alutaceous. Scutellum short, rounded posteriorly. *Elytra* elongate, sides divergent in basal two-thirds, then rounded to apex; striae deep; punctures rounded, approximately own diameter apart, each with a short, fine, prostrate seta; intervals broad, flat, finely alutaceous, punctures not apparent; pubescence short, fine prostrate; first interval depressed behind scutellum in basal fourth. *Ventral side* with abdominal segments coarsely punctate, clothed with short, fine, prostrate pubescence. Length 3.4 mm., width 1.4 mm.

Female: Unknown.

Holotype, ♂, Glacier Pt. Bog, [Yosemite National Park, Altitude 7600 Feet], California VII-24-1946 (C. P. Alexander, E.L.S.).

Easily separated from *P. gallicola* Riley by the shorter sparser pubescence, near absence of an apical constriction of the prothorax and the coarse punctures of the abdominal segments. This may be the *P. gallicola* from California of Fall (1898) in his monograph of the *Apion*.

Smicronyx mackenziei Sleeper, new species

Male.—Elongate-oval; black, femora and tibiae dark reddish black; densely clothed with prostrate, overlapping, pearl white, flat elongate-oval scales and semierect, long, narrow, yellowish white scales.

Rostrum about one-half longer than pronotum, evenly curved, basal half

strongly, coarsely punctured, punctures of apical half finer; a broad median smooth line dorsally. Antennae inserted at apical two-fifths; scape not attaining eyes. Second segment of funicle longer than third, elongate. Scape and funicle densely clothed with large white scales. Club finely densely pubescent. Head finely closely punctate. Constriction between rostrum and head very strong. *Prothorax* as long as wide, sides evenly arcuate with a prominent apical constriction; pronotum with sparsely placed, coarse, shallow punctures, area between punctures strongly alutaceous; sculpture obscured by dense vestiture. Scutellum minute, rounded. *Elytra* with sides parallel in basal half, then arcuate to apices; humeri evenly rounded; striae feebly impressed; strial punctures minute, barely perceptible; intervals broad, flat, finely wrinkled transversely; semierect, long narrow scales in a single row on each interval. *Ventral side* clothed as dorsum, broad flat scales sparser on abdominal segments which are smooth, shining, very sparsely punctured, each puncture with a scale. Prosternum deeply emarginate before coxae. Legs clothed as body; all tibiae unguiculate. Claws long, slender, slightly divergent, feebly connate in basal fourth. Length 2.2 mm., width 1.0 mm.

Female.—Rostrum longer, more slender, feebly curved. Length 2.3 mm., width 1.1 mm.

Holotype, ♂, and allotype, ♀, BORREGO, CALIFORNIA IV-6-40 (G. P. Mackenzie, E.L.S.). Two paratypes, both males (E.L.S., and C.A.F.).

S. mackenziei belongs in the *corniculatus* group of Dietz (1894). It keys to *sprucus* Casey (= *vestitus* LeConte), but is wholly unlike any of the species in this group. It differs from *vestitus (= sprucus)* in having the scales above white instead of pale brown, and the prothorax without vittae; prosternum is emarginate before the coxae. *S. mackenziei* superficially resembles *resplendens* but may be easily separated by the feebly connate tarsal claws, instead of to middle.

Rhynchaenus griseus Sleeper, new species

Female.—Elongate-oval, subdepressed; black, antennae, legs, and tarsi dark reddish brown; densely clothed with short, coarse, appressed, yellow setae. Scutellum densely clothed with yellowish white pubescence.

Rostrum three-fourths longer than pronotum, feebly curved, cylindrical, coarsely deeply punctured in basal two-thirds, finer in apical fourth. Antennae inserted in basal fourth, scape not attaining eye. Funicle six-segmented, first segment robust and one-half longer than second, second and third subequal. Club strongly ovate, compact. Head coarsely, closely punctate. Eyes prominent, strongly convex, separated by less than one-tenth their diameter. *Prothorax* one-half wider than long, sides strongly rounded to apical constriction; pronotum closely, coarsely, deeply punctured, each puncture with a recurved seta. *Elytra* with sides evenly rounded from base

to apex, widest about middle; humeri rounded, not prominent; striae deeply impressed, strial punctures large, round, deep, about their own diameter apart, each puncture with a prostrate yellow seta; intervals strongly confusedly punctate, area between punctures alutaceous. *Ventral side* with vestiture as on dorsum but sparser, Abdominal segments, strongly convex, finely, densely punctured; fifth segment longer than fourth, posterior margin evenly rounded at apex. Posterior femora robust with one large and two small denticles. Tibiae thin, flattened on exterior surface, anterior and posterior edges straight. Claws with a broad tooth basally. Length 3.2 mm., width 1.5 mm.

Male.—Very similar to female, but differs in having the rostrum slightly shorter and pygidium broadly exposed.

Holotype, ♀, GREENLEE COUNTY, ARIZONA NEAR BULLARD PEAK VIII-20-42 (C. W. Jones, E.L.S.). Allotype, ♂, Whitewater Forest Camp, 5 mi. N.E. of Glenwood, Catron County, New Mexico VIII-21-52 (H. B. Leech and J. W. Green, C.A.S.). Fifty-two paratypes as follows: 9 Whitewater Forest Camp, VIII-21-52 (H. B. Leech and J. W. Green), 3 Sycamore Creek, Yavapai County, Arizona VIII-18-42 (C. W. Jones, E.L.S.); 36 Whitewater Forest Camp VIII-21-52, on mulberry leaves (H. B. Leech and J. W. Green, C.A.S.); 5 from 4 mi. N.E. Glenwood, New Mexico VIII-20-52 (H. B. Leech and J. W. Green, C.A.F.).

This species is nearest *R. puberulus* (Boheman) but differs in having denser yellow pubescence, narrower hind tibiae, more densely punctured pronotum and denser, shorter, coarser vestiture of abdominal segments.

STRONGYLOTES PARALLELA Champion

Strongylotes parallelus Champion 1907: 207.

Three examples of this species have been collected by Professor and Mrs. J. N. Knull in the Chiricahua Mountains, Arizona, all are deposited in the Entomological Collection at Ohio State University. *S. parallela* was described from Ciudad in Durango, Mexico and as far as I am able to ascertain was previously known only from the type series.

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OBSERVATIONS ON THE BIOLOGY OF *ANOPLIUS FULGIDUS* CRESSON

(Hymenoptera: Pompilidae)

MARIUS S. WASBAUER

University of California, Berkeley

In February 1953, at Ft. Sam Houston, Bexar County, Texas, a population of small bluish wasps was discovered in the vicinity of an artesian well on Salado Creek. Two females and eight males were collected and subsequently identified as *Anoplius (Anoplius) fulgidus* Cresson. The banks of Salado Creek are composed of heavy loam densely covered by herbaceous growth, mainly grass. It is a slow moving, muddy, warm water stream for the most part but the water entering from the artesian well is clear and relatively fast and it is only in this area that the wasps were found. They moved extremely rapidly, flying very near the water surface and frequently dodging in and out through the grass and other low herbage that covered the bank. From the first, it was evident that the males far outnumbered the females. The latter, when seen, were usually running over the ground near the water's edge, vigorously applying their antennae to the various objects they encountered. Dead leaves and dry reed stems seemed to have a particular attraction. One female was observed to investigate under a single leaf five times in the space of ten minutes. Whenever females appeared on the scene, the males in the vincinity became greatly agitated and often followed them along the ground, rapidly twitching their wings. Every female seen had a complement of from one to four interested males following her erratic progress along the ground and through the vegetation. In two cases, males flew down and alighted on females that were resting on vertical reed stems. One of these pairs separated immediately and the other fell or flew down among the bases of the reeds and was lost to view. In several instances females turned and drove the males off. It seems apparent that sexual activity was occuring but whetheror not coitus had taken place in the above cases was impossible to determine due to the rapidity of the insects' movements.

On February 10, at 2:10 p.m., a small female was observed dragging a spider in a dense stand of reeds about a foot offshore. The spider was gripped by the base of one of the hind legs and the wasp was slowly, laboriously towing it backwards up a nearly

vertical reed stem. Its progress was continually hampered by the front tarsi of the prey catching on the stem. At one such time, it lost its grip and the spider slid down and off into the water. After nervously running back and forth with rapid wing twitching, the pompilid flitted down and, alighting on the water, picked up the spider again by the hind leg, and returned to the stem. It then shifted its grip to the abdominal pedicel, trailing both the cephalothorax and abdomen. At 2:30 p.m. it reached a portion of the blade that had picked up some floating detritus at an earlier period of high water and deposited the spider in a shallow depression in the debris, flying off immediately thereafter. An hour later the spider was collected but subsequent examination showed no evidence of oviposition. There was a large irregular hole in the posterior portion of the cephalothorax, indicating that it may have been used for feeding purposes. Dr. W. J. Gertsch later kindly identified it as a female *Pirata sedentarius* Montgomery (Lycosidae) which he characterized *(in litt.)* as " . . . a water loving spider and quite frequently amphibious."

On February 11, another wasp was seen repeating essentially the same process, but before observation got underway the wasp flew with its prey into the dense tangled grass of the stream bank and disappeared, reappearing immediately thereafter but without the spider. A careful search of the area was made but the lost arachnid could not be located.

The actual alighting of a wasp on the water was a seemingly purposeful action and is thus of considerable interest. Later, another observer, Mr. R. Fulghum, reported seeing a female from this same population run across the water before taking flight.

Observations were made on the Salado Creek wasps whenever time permitted, for short periods at weekly intervals. No further nesting activity was noted after February 16, and females were not seen after the end of that month, although males persisted until about March 15, when they too disappeared.

The early dissipation of the population might be explained on the basis that the artesian well area was the site of emergence and that the adults were merely reluctant to leave for greener pastures. This seems unlikely, however, since apparently nesting activity was going on there and although the stream was explored

for two miles in either direction after their disappearance from the original site, not a single wasp could be found.

From the meager information available on this species, it seems that it is not often attracted to flowers. In eighteen months of collecting in the vicinity of Bexar County, Texas by several persons, a number of species of *Anoplius* (sensu lato) were taken on the blossoms of many plants, especially the suffrutescent species and more particularly *Condalia, Colubrina* and *Baccharis* but *Anoplius (A.) fulgidus* was conspicuous by its absence. The few specimens taken by the author at Santa Elena Canyon, Big Bend National Park, Texas, were collected on a bare sand-mud bank along the Rio Grande River. Of the 52 specimens seen by Evans (1951:341), one female, taken at Limpia Canyon, Jeff Davis County, Texas (by that author) was on flowers of *Baccharis glutinosus*.

It is interesting to note that although its morphological pattern suggests a close relationship with *virginiensis* Cresson, in habitat preference at least, *fulgidus* seems to show affinities with *ithaca* (Banks) and *depressipes* (Banks). Information on the biologies of these related species is given by Evans (1948, 1949), Rau (1934), and Caudell (1922).

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